

CLAIMS:

1. A three-dimensional printing system, comprising:
a printing head to print three-dimensional objects; and
5 a printing tray with a selected adhesion characteristic.
2. The printing system of claim 1, wherein said tray includes a high adhesion surface coating.
3. The printing system of claim 2, wherein said surface coating is an anodized layer.
4. The printing system of claim 3, wherein said anodized coating includes pores
10 containing a material to act to adhere to said objects.
5. The printing system of claim 3, wherein said anodized coating includes pores containing water to act to adhere to said objects.
6. A three-dimensional printing system, comprising:
a printing head to print three-dimensional objects; and
15 a printing tray with a thermal coefficient similar to that of printed objects.
7. The printing system of claim 6, wherein said printing tray includes organic material.
8. The printing system of claim 6, wherein said printing tray comprises a material substantially similar to a material included in said objects.
9. A printing sub-system for three-dimensional printing, comprising:
20 a printing head to deposit material for a three-dimensional object;
a printing tray; and
a temperature control unit to control the temperature in the apparatus.
10. The printing sub-system of claim 9, wherein said printing tray unit includes at least one cooling tunnel.
- 25 11. The printing sub-system of claim 9, wherein said printing tray unit includes an adhesive coating.
12. The printing sub-system of claim 9, wherein said temperature control unit includes a heating source.
13. The printing sub-system of claim 9, wherein said temperature control unit includes a
30 cooling source.
14. The printing sub-system of claim 9, wherein said temperature control unit is integrated into said printing tray.

15. The printing sub-system of claim 9, wherein said temperature control unit includes a temperature-sensing unit.
16. The printing sub-system of claim 9, comprising an insulation coating.
17. The printing sub-system of claim 9, comprising insulation structures.
- 5 18. The printing sub-system of claim 9, comprising an upper heating element to heat upper layers of an object being printed.
19. The printing sub-system of claim 9, comprising a radiation source.
20. The printing sub-system of claim 9, comprising a curing lamp.
21. The printing sub-system of claim 9, comprising at least two leveling devices and a
10 printing head array.
22. The printing sub-system of claim 9, comprising a curing lamp located at a side of a leveling device.
23. A printing apparatus for three-dimensional printing, comprising:
a printing head to deposit material for a three-dimensional object;
15 a printing tray; and
a blowing unit to cool the printing apparatus.
24. A printing apparatus for three-dimensional printing, comprising:
a printing head to deposit material for a three-dimensional object;
a printing tray; and
20 a sucking unit to cool the printing apparatus.
25. A printing apparatus for three-dimensional printing, comprising:
a printing sub-system; and
an insulation area to insulate a printed object
26. The apparatus of claim 25, wherein said insulation area includes a temperature control
25 unit.
27. The apparatus of claim 25, comprising at least two printing trays.
28. A printing apparatus for three-dimensional printing, comprising a controller to control construction of building material at the base of an object to be printed, and print the object on said construction.
- 30 29. The printing apparatus of claim 28, wherein said controller acts to dispense building material beneath the base of said object to be printed.
30. The printing apparatus of claim 28, wherein said construction is to adhere to said object and is to adhere to a printing tray on which said object is to be printed.

31. The printing apparatus of claim 28, wherein said construction is to provide a barrier layer between said object and said printing tray.
32. The printing apparatus of claim 28, wherein said construction is to provide a carpet for said object.
- 5 33. The printing apparatus of claim 28, wherein said construction is to provide a pedestal for said object.
34. The printing apparatus of claim 28, wherein said construction is to raise said object being built within the leveling range of a leveling device.
- 10 35. A printing apparatus for three-dimensional printing, comprising a controller to control the building of a thickening layer of building material of a predetermined thickness around a printed object.
36. The printing apparatus of claim 35, wherein said thickening layer comprises one or more building materials.
- 15 37. A printing apparatus for three-dimensional printing, comprising a controller to position a printing tray at a relatively high level prior to printing, said level enabling compensation for shrinkage in a previously printed and cured layer.
38. A printing apparatus for three-dimensional printing, comprising a controller to control the delivery of shockwaves to a printing tray holding a printed object.
- 20 39. A printing apparatus for three-dimensional printing, comprising a controller to control the printing of a three-dimensional object with an adjacent support construction, said object and said support construction being separated by a barrier, said barrier including vacant pixels.
40. A printing apparatus for three-dimensional printing, comprising a controller to control the printing of a support construction, said support construction including support material and modeling material elements within said support material, said modeling material elements to reinforce said support material.
- 25 41. The printing apparatus of claim 40, wherein said support construction includes a grid of pillars within said support material.
42. The printing apparatus of claim 40, wherein said support construction includes a grid of pillars to be in direct contact with support material.
- 30 43. The printing apparatus of claim 40, wherein said support construction includes a grid of pillars to be in direct contact with a printing tray.

44. The printing apparatus of claim 40, wherein said controller is to control constructing of at least one said support construction as a body outline around a printed object.
45. A printing apparatus for three-dimensional printing, comprising a controller to detect defective nozzles, and to adjust printing coordinates to compensate for said defective
5 nozzles.
46. The printing apparatus of claim 45, wherein said controller is to control adjustment parameters selected from the group consisting of print head shifting, print head movement, and input data conversion.
47. The printing apparatus of claim 45, wherein said controller is to control adjustment
10 parameters with a shift algorithm.
48. The printing apparatus of claim 45, wherein said controller is to enable printing a first layer of an object to be printed by a printing head having a certain reference frame; and printing a second layer of an object to be printed by said printing head, said printing head having a second reference frame, said second reference frame being different from said
15 first reference frame.
49. A printing apparatus for three-dimensional printing, comprising a controller to enable moving a printing head in a forward passage when printing an object, and adjusting the height of a printing tray prior to the reverse passage of said printing head.
50. A printing apparatus for three-dimensional printing, comprising a controller to shift
20 the step of a nozzle array, where said nozzle array includes a large nozzle step.
51. The printing apparatus of claim 50, wherein said controller is to enable printing additional layers in a first direction, and lowering the printing tray for each additional layer printed in said first direction.
52. The printing apparatus of claim 50, wherein said controller is to enable printing
25 additional layers in a second direction, said number of additional layers being related to said nozzle step divided by the size of the nozzle droplet stain.
53. A method of three-dimensional object printing comprising printing an object on a printing tray with an adhering surface characteristic.
54. The method of claim 53 wherein the tray includes an adonized coating.
- 30 55. The method of claim 53 wherein the tray includes pores that include material that attracts modeling material.
56. The method of claim 54 comprising introducing water into pores of said anodized coating.

57. The method of claim 53 comprising pre-treating said printing tray with water.
58. A method of three dimensional object printing comprising increasing adherence of an object being printed to a printing tray, by printing an object onto a printing tray with a thermal coefficient substantially similar to the thermal coefficient of said object.
- 5 59. The method of claim 58 comprising printing an object onto a printing tray made of organic material.
60. The method of claim 58, wherein said tray includes substantially similar material to a printed object.
61. A three-dimensional object printing method comprising:
- 10 printing a construction of building material at the base of an object to be printed; and printing the object on said construction.
62. The printing method of claim 61, comprising dispensing building material beneath the base of said object to be printed.
63. The printing method of claim 61, wherein said construction is to adhere to said object and is to adhere to a printing tray on which said object is to be printed.
- 15 64. The printing method of claim 61, wherein said construction is to provide a barrier layer between said object and said printing tray.
65. The printing method of claim 61, wherein said construction is to provide a carpet for said object.
- 20 66. The printing method of claim 61, wherein said construction is to provide a pedestal for said object.
67. The printing method of claim 61, wherein said construction is to raise said object being built within the leveling range of a leveling device.
68. A three-dimensional object printing method, comprising controlling the temperature of
- 25 an object being printed.
69. The method of claim 68, comprising heating a printing tray to a selected temperature.
70. The method of claim 68, comprising cooling said object.
71. The method of claim 69, comprising heating said printing tray to substantially the glass transition point of said object.
- 30 72. The method of claim 68, comprising:
- depositing support material; and
- heating said printing tray to substantially the glass transition point of said support material.

73. The method of claim 68, comprising controlling the temperature of an upper layer of material of said object.
74. The method of claim 73, comprising controlling said temperature of said upper layer to be above the glass phase transition of said material.
- 5 75. The method of claim 73, comprising controlling said temperature of said upper layer by a mechanism selected from the group consisting of electromagnetic radiation, exothermic chemical curing, a heating element, and a cooling element.
76. The method of claim 73, comprising heating the material of said upper layer before depositing said material.
- 10 77. A three-dimensional object printing method, comprising controlling the temperature in a printing sub-system during a printing process.
78. The method of claim 77, wherein said controlling uses temperature control mechanisms selected from the group consisting of a heating element, a cooling element, a curing unit, a radiation unit, and an insulated printing sub-system.
- 15 79. The method of claim 77, comprising controlling cooling of said printing sub-system.
80. The method of claim 77, comprising moving a printing tray to an insulation area.
81. The method of claim 80, wherein said insulation area includes an area within the printing sub-system.
82. The method of claim 80, wherein said insulation area includes an area outside of the printing sub-system.
- 20 83. The method of claim 80, wherein said insulation area is a removable structure.
84. A three-dimensional object printing method, comprising printing a thickening layer of building material of a predetermined thickness around a printed object.
85. The method of claim 84, wherein said building material is support material.
- 25 86. The method of claim 84, wherein said building material is a combination of support material and modeling material.
87. The method of claim 84, comprising curing and cooling said object.
88. The method of claim 87, comprising removing the thickening layer after said curing.
89. A three-dimensional object printing method, comprising:
- 30 printing a first layer of building material;
curing said first layer of material; and
printing an additional layer, said additional layer being printed after said first layer is cured.

90. The method of claim 89, comprising positioning a printing tray at a relatively high level prior to printing, said level enabling compensation for the shrinkage in the previously printed and cured layer.
91. A method of three-dimensional printing, comprising exposing a printing tray holding a printed object to a cold source.
92. The method of claim 91, wherein said cold source is selected from the group consisting of cold water, a blowing unit, a sucking unit, and a temperature control unit.
93. A method of three-dimensional printing, comprising delivering shock waves to a printing tray holding a printed object.
94. A three-dimensional object printing method, comprising printing a support construction on a printing tray prior to printing an object, said support construction including one or more layers of modeling material.
95. The method of claim 94, comprising covering said modeling material with support material.
96. The method of claim 95, wherein said support material protrudes outside the boundaries of said object.
97. The method of claim 95, comprising depositing modeling material over said support material.
98. The method of claim 94, wherein said support construction comprises a combination of modeling material and support material.
99. The method of claim 94, wherein the support construction comprises one or more pillars of modeling material interspersed with support material.
100. A three-dimensional object printing method, comprising printing a three-dimensional object with an adjacent support construction, said object and said support construction being separated by a barrier, said barrier including vacant pixels, said vacant pixels allowing for the spread of modeling and support materials into said barrier.
101. A three-dimensional printing method, comprising printing a support construction, said support constructing including support material and modeling material elements within said support material, said modeling material elements to reinforce said support material.
102. The method of claim 101, wherein said support construction includes a grid of pillars within said support material.

103. The method of claim 102, wherein said pillars are larger around the periphery of said support material.
104. The method of claim 102, wherein said pillars are more closely spaced around the periphery of said support material.
- 5 105. The method of claim 101, comprising constructing a wall of modeling material surrounding said support construction.
106. The method of claim 101, comprising constructing a continuous area of support material reinforced by modeling material.
107. The method of claim 101, comprising constructing at least one said support
10 construction as a body outline around a printed object.
108. The method of claim 101, comprising constructing a layer of support material between an object and said support construction, said layer to be overlaid by one or more support construction layers with different characteristics.
109. The method of claim 101, comprising constructing a continuous area of support
15 material reinforced by a continuous element of modeling material.
110. The method of claim 101, comprising constructing a continuous area of support material reinforced by non-continuous elements of modeling material.
111. The method of claim 101, comprising constructing a continuous area of support material reinforced by a grid of modeling material, said grid of modeling material to be in
20 direct contact with a printed object.
112. The method of claim 101, comprising constructing a continuous area of support material reinforced by a grid of modeling material, said grid of modeling material to be in direct contact with a printing tray.
113. A three-dimensional object printing method, comprising:
25 detecting defective nozzles; and
adjusting printing coordinates to compensate for said defective nozzles.
114. The method of claim 113, where said adjusting includes controlling adjustment parameters selected from the group consisting of print head shifting, print head movement, and input data conversion.
- 30 115. The method of claim 113, comprising adjusting said printing coordinates with a shift algorithm.
116. A method for 3-D printing, comprising:

printing a first layer of an object to be printed by a printing head having a certain reference frame; and

printing a second layer of an object to be printed by said printing head, said printing head having a second reference frame, said second reference frame being different from
5 said first reference frame.

117. The method of claim 116, wherein each of said first layer and said second layer includes a portion of required pixels.

118. The method of claim 116, wherein said first layer and said second layer have different height values.

10 119. The method of claim 116, comprising printing a subsequent layer over said second layer.

120. The method of claim 116, comprising performing said printing according to a shift algorithm.

121. A method for 3-D printing, comprising:

15 moving a printing head in a forward passage when printing an object; and
adjusting the height of a printing tray prior to the reverse passage of said printing head.

122. The method of claim 121, wherein said adjusting includes increasing said printing tray height.

20 123. A method of three-dimensional object printing comprising shifting the step of a nozzle array, where said nozzle array includes a large nozzle step.

124. The method of claim 123, wherein said shifting the step includes printing additional layers in a first direction, and lowering the printing tray for each additional layer printed in said first direction.

25 125. The method of claim 123, wherein said shifting the step includes printing additional layers in a second direction, said number of additional layers being related to said nozzle step divided by the size of the nozzle droplet stain

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